

REMARKS

Reexamination and reconsideration of this application in view of the present response without amendment is kindly requested. By this amendment, none of the claims have been amended. After this response, Claims 1-15, and 40 remain pending in this application.

Claim Rejections - 35 USC § 103

The Examiner rejected Claims 1-15 and 40, under 35 U.S.C. 103(a) as being unpatentable over publication CHIU Chemical Vapor Deposition 200, 6, No 5, page 223-225, (hereinafter referred to as "Chiu").

Applicants respectfully traverse the Examiner's rejection of Claims 1-15 and 40 under 35 U.S.C. 103(a). Applicants assert that Chiu does not teach, anticipate, or suggest, *inter alia*,

heating carrier material to a heating temperature of between approximately 200°C and 400°C; and

circulating a gas mixture comprising tert-butylinotris (diethylamino) tantalum ($\text{t-BuN}=\text{Ta}(\text{NEt}_2)_3$) in contact with the heated carrier material under an oxidizing atmosphere thereby forming a layer of tantalum pentoxide (Ta_2O_5) on the carrier material, the partial pressure of the tert-butylinotris (diethylamino) tantalum being greater than or equal to 25 mTorr,

as recited for independent Claim 1, and for all dependent claims depending therefrom.

The presently claimed invention is directed at the combination of a vapor phase deposition process of tantalum pentoxide from TBtDET organometallic precursor at low temperature (between approximately 200°C and 400°C), under high TBtDET partial pressure (greater than or equal to 25 mTorr) allowing the deposition of good quality tantalum

pentoxide layers. Chiu fails to teach or suggest this claimed combination.

Overview of Chiu

CHIU Chemical Vapor Deposition 200, 6, No 5, page 223-225, describes a deposition process to form a layer of tantalum oxide (Ta_2O_5) out of TBTDDET precursor. The deposition process is performed in a vapor phase, under an oxidizing atmosphere on a silicon substrate. Deposition temperature ranges from 573 to 873K. Without annealing, film roughness is around 2,3nm. Observed in cross section under scanning electron microscopy, the film presents a columnar structure.

The electrical results shown in this paper are obtained from the measurement of a Ta_2O_5 layer deposited at 873K.

Devices were patterned out of such a layer to characterize the electrical properties of the layer. Those devices are made out of a Ta_2O_5 film 180nm thick on a silicon substrate. Aluminium electrodes 500nm and 200nm thick were patterned on top of the tantalum oxide layer, and under the silicon substrate. The best performances were obtained after a 30 min annealing under 1atm of O_2 at 1123K.

Analysis Of The Present Claims In View Of

Chiu

First of all, while the Examiner acknowledges in the Office Action that Chiu fails to teach a specific temperature, the Examiner considers that the temperature is a well known deposition parameter in the CVD art and that the determination of optimum temperature would be within the skill of one of ordinary skill practicing in the art.

Applicants fully disagree.

It seems the Examiner has used an "ex post facto" analysis in view of the Applicants teachings in the present application. As a matter of fact, the invention is not solely directed toward the TBTDET use but toward the combination of TBTDET use, heating of the carrier material between 200°C and 400°C, and partial pressure of TBTDET greater than or equal to 25mTorr. This novel and non-obvious combination of process steps, as has been determined by the inventors through significant experimentation, allowed the formation of good quality tantalum oxide layers. See the specification, page 4, lines 4-25, and page 6, lines 4-9. Chiu does not teach, anticipate, nor suggest, the presently claimed combination of process steps.

The quality of the film obtained according to the process described in the Chiu document does not match the quality of the film obtained with the presently claimed process. Indeed, the Chiu document describes a 180nm film exhibiting a leak current of 2×10^{-4} A.cm⁻² under an electric field of 0.5 MV. cm⁻², while a 180nm thick layer obtained by the presently claimed process would by extrapolation exhibit a 10^{-20} A.cm⁻² leak current under an electrical field of 0.2 MV. cm⁻².

Also, the only improvement of the quality suggested in the Chiu document is an improvement of the deposition rate.

Therefore, nothing in the Chiu document would have motivated a person or ordinary skill in the art to use the claimed combination of the deposition temperature range (heating of the carrier material between 200°C and 400°C) and partial pressure of TBTDET greater than or equal to 25mTorr to improve the quality of the Ta₂O₅ layer.

Moreover, no partial pressure is disclosed nor suggested in the Chiu document.

Therefore, Applicants believe that the Chiu document neither discloses nor suggests the presently claimed invention, as recited for Claim 1, and for all of the dependent claims depending therefrom.

Accordingly, in view of the remarks above, since Chiu, does not teach, anticipate, or suggest, the presently claimed combination of process steps as recited for independent Claim 1, and for all of the dependent Claims 2-15 and 40, that depend from the independent claim, Applicants believe that the rejection of Claims 1-15, and 40, under 35 U.S.C. 103(a) has been overcome. The Examiner should withdraw the rejection of these claims and allow Claims 1-15 and 40 to issue in a U.S. patent.

Conclusion

The foregoing is submitted as full and complete response to the Official Action mailed June 7, 2006, and it is submitted that Claims 1-15 and 40 are in condition for allowance. Reconsideration of the rejection is requested. Allowance of Claims 1-15 and 40 is earnestly solicited.

No amendment made was related to the statutory requirements of patentability unless expressly stated herein. No amendment made was for the purpose of narrowing the scope of any claim, unless Applicants have argued herein that such amendment was made to distinguish over a particular reference or combination of references.

Applicants acknowledge the continuing duty of candor and good faith to disclose information known to be material to the examination of this application. In accordance with 37 CFR § 1.56, all such information is dutifully made of record. The foreseeable equivalents of any territory surrendered by amendment are limited to the territory taught by the information of record. No other territory afforded by the doctrine of equivalents is knowingly surrendered and

everything else is unforeseeable at the time of this amendment by the Applicants and the attorneys.

If the Examiner believes that there are any informalities that can be corrected by Examiner's amendment, or that in any way it would help expedite the prosecution of the patent application, a telephone call to the undersigned at (561) 989-9811 is respectfully solicited.

The present application, after entry of this response, comprises sixteen (16) claims, including one (1) independent claim. Applicants have previously paid for thirty-nine (39) claims including three (3) independent claims. Applicants, therefore, believe that a fee for claims amendment is currently not due.

A petition for extension of time to file this Response is hereby incorporated herein. The Commissioner is authorized to charge the appropriate fee amount to prevent this application from becoming abandoned, to Deposit Account **50-1556**.


The Commissioner is hereby authorized to charge any fees that may be required or credit any overpayment to Deposit Account **50-1556**.

In view of the preceding discussion, it is submitted that the claims are in condition for allowance. Reconsideration and re-examination is requested.

Respectfully submitted,

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By: _____


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